

Patent Claims:

1. Brake-by-wire actuator for actuating the brake system of a motor vehicle, comprising a simulator (2) which can be acted upon by a brake pedal (1), with an output signal of an actuation sensor (3) being sent to an electronic control unit (4) which controls a pressure source in response to the signal of the actuation sensor (3), and with an output of the pressure source that is connected to a distributor device (10) for the brake force and actuates individual wheel brakes (16) of the vehicle, also comprising means for enabling actuation of the brakes by muscular power within a fallback mode,
characterized in that a lost travel (a) is provided between a first actuation component (47) such as the brake pedal (1) in particular or a component (36; 21) articulated at the brake pedal (1) and a second actuation component (37) that is connected downstream in the flux of force, in particular an input member (5), in order to uncouple the first actuation component (47) mechanically from the reactions of force of the motor vehicle brake system in a by-wire mode.
2. Brake-by-wire actuator as claimed in claim 1,
characterized in that a means (38) is provided in order to automatically reduce the lost travel (a) after a by-wire mode at the commencement of a brake actuation executed by muscular power.
3. Brake-by-wire actuator as claimed in claim 2,
characterized in that said means (38) may be actuated by means of an electric, electromagnetic,

hydraulic, or pneumatic actuator (39), which will automatically adopt a closing position for reducing the lost travel (a) in the fallback mode.

4. Brake-by-wire actuator as claimed in claim 3, characterized in that the means (38) is provided as a clutch (20) between the two actuation components (47, 37).
5. Brake-by-wire actuator as claimed in claim 4, characterized in that the means (38) comprises a block-shaped body (40) which bridges the lost travel (a) between the actuation components (47, 37) in a form-fit manner.
6. Brake-by-wire actuator as claimed in claim 4, characterized in that the actuator (39) includes a spring (41) for the elastic preload of the block-shaped body (40) and a solenoid (42) for returning or keeping back the block-shaped body (40) in the opening position.
7. Brake-by-wire actuator as claimed in claim 1, characterized in that the pressure source comprises a hydraulic booster with at least one hydraulic pump (53) which is actuatable by electric signals in the by-wire mode, and in that the actuation in the fallback mode is carried out hydraulically by way of a master brake cylinder (11).
8. Brake-by-wire actuator as claimed in claim 7, characterized in that the pump (53) feeds a high-pressure accumulator (54).

9. Brake-by-wire actuator as claimed in claim 1, characterized in that the pressure source comprises a pneumatic booster (6) which is actuatable by electric signals in the by-wire mode and mechanically by way of the actuation components (47, 37) in the fallback mode.
10. Brake-by-wire actuator as claimed in claim 9, characterized in that the pressure source includes a pneumatic booster (6) and additionally a hydraulic pump (53) being actuated, for example, in the event of a defect of the pneumatic booster (6) or when boosting is not sufficient.
11. Brake-by-wire actuator as claimed in claim 9, characterized in that the pressure source includes an electromotively driven master brake cylinder.
12. Brake-by-wire actuator as claimed in any one of claims 7 to 11, characterized in that there is provision of one or more sensors, in particular a travel sensor (17), a pneumatic pressure sensor or differential pressure sensor in the pneumatic booster (6), and/or a hydraulic pressure sensor (18) in a brake circuit detecting deviations from nominal values, and in that the electronic unit (4) on account of detected sufficient deviations detects a malfunction such as the inclusion of air or a circuit failure in the brake system and initiates appropriate safety processes such as the fallback mode in particular.

13. Brake-by-wire actuator as claimed in claim 12, characterized in that the travel sensor (17) and/or pressure sensor/differential pressure sensor detects a point of maximum boosting of the booster (6), and in that the hydraulic pump (53) is started by way of the electronic unit (4).
14. Brake-by-wire actuator as claimed in claim 1, characterized in that the simulator (2) includes a motor (19) or a spring (28) used to generate reaction forces.
15. Brake-by-wire actuator as claimed in claim 4, characterized in that the position of the point of application of the brake pedal (1) in relation to the subsequent actuation component (5) is adjustable.
16. Brake-by-wire actuator as claimed in claim 15, characterized in that the brake pedal (1) is coupled to a clutch shaft (21) pivotally mounted in its longitudinal direction which is longitudinally displaceable relative to the input member (5) in dependence on its rotary position relative to the input member (5) or is in engagement with the input member (5) in an axial direction.
17. Brake-by-wire actuator as claimed in claim 16, characterized in that both the clutch shaft (21) and the input member (5) include projections (23, 30) serially arranged in their longitudinal direction in a row (22, 31), and in a first rotary position of the clutch shaft (21) in relation to the input member (5), the

projections (23, 30) of the clutch shaft (21) and the input member (5) are disengaged, while in a second rotary position at least one projection (30) of the clutch shaft (21) is engaged with a projection (23) of the input member (5).

18. Brake-by-wire actuator as claimed in claim 17, characterized in that several rows (22, 31) of projections (23, 30) are provided at a predetermined angular distance over a periphery of the input member (5) and the clutch shaft (21).
19. Brake-by-wire actuator as claimed in claim 17, characterized in that the clutch shaft (21) is equipped with a longitudinal bore (25) that is open towards the input member (5), with one end of the input member (5) projecting into said bore, and in that peripheral surfaces (24, 35) of the end of the input member (5) and of the longitudinal bore (25) in the clutch shaft (21) carry the projections (23, 30).
20. Brake-by-wire actuator as claimed in claim 16, characterized in that the clutch (20) includes a spring (28) whose first end is supported on a housing (32) of the clutch (20) and whose second end is supported on a transmission member (26), with said transmission member (26) being connectable to the clutch shaft (21) pivotally mounted in its longitudinal direction, with said clutch shaft (21) being longitudinally displaceable in relation to the transmission member (26) in dependence on its rotary position with respect to the transmission member (26) or

being in engagement with the transmission member (26) in an axial direction by way of projections (33, 34).

21. Brake-by-wire actuator as claimed in claim 20, characterized in that the clutch shaft (21) is in engagement with the input member (5) and disengaged from the transmission member (26) in at least one first rotary position and is disengaged from the input member (5) and in engagement with the transmission member (26) in at least one second rotary position.